**Data Center Knowledge**™

ONLINE SURVEY: 2020 & 2017

# Data Center Trends: Use of Liquid Cooling

**informa engage**
TARGETED MARKETING SERVICES

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# Introduction & Methodology

## OVERVIEW

Methodology, data collection and analysis by Informa Engage and Data Center Knowledge, exclusively for Dell.

2017 Data collected August 10, through August 21, 2017.

2020 Data collected October 26, through November 10, 2020.

Methodology conforms to accepted marketing research methods, practices and procedures.

## METHODOLOGY

2017
On August 1, 2017, Informa Engage emailed invitations to participate in an online survey to subscribers of Data Center Knowledge.

By August 21, 2017, Informa Engage had received 131 completed surveys from respondents indicating data center involvement.

2020
On October 26, 2020, Informa Engage emailed invitations to participate in an online survey to subscribers of Data Center Knowledge.

By November 10, 2020, Informa Engage had received 149 completed surveys from respondents indicating data center involvement.

## RESPONSIVE MOTIVATION

To encourage prompt response and increase the response rate overall, a live link to the survey was included in the email invitation to route respondents directly to the online survey.

The invitations and survey were branded with the relevant brand logo, in an effort to capitalize on user affinity for these valued brands.

Each respondent was afforded the opportunity to enter a drawing for one of four $100 Amazon gift cards.

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# Respondent Profile
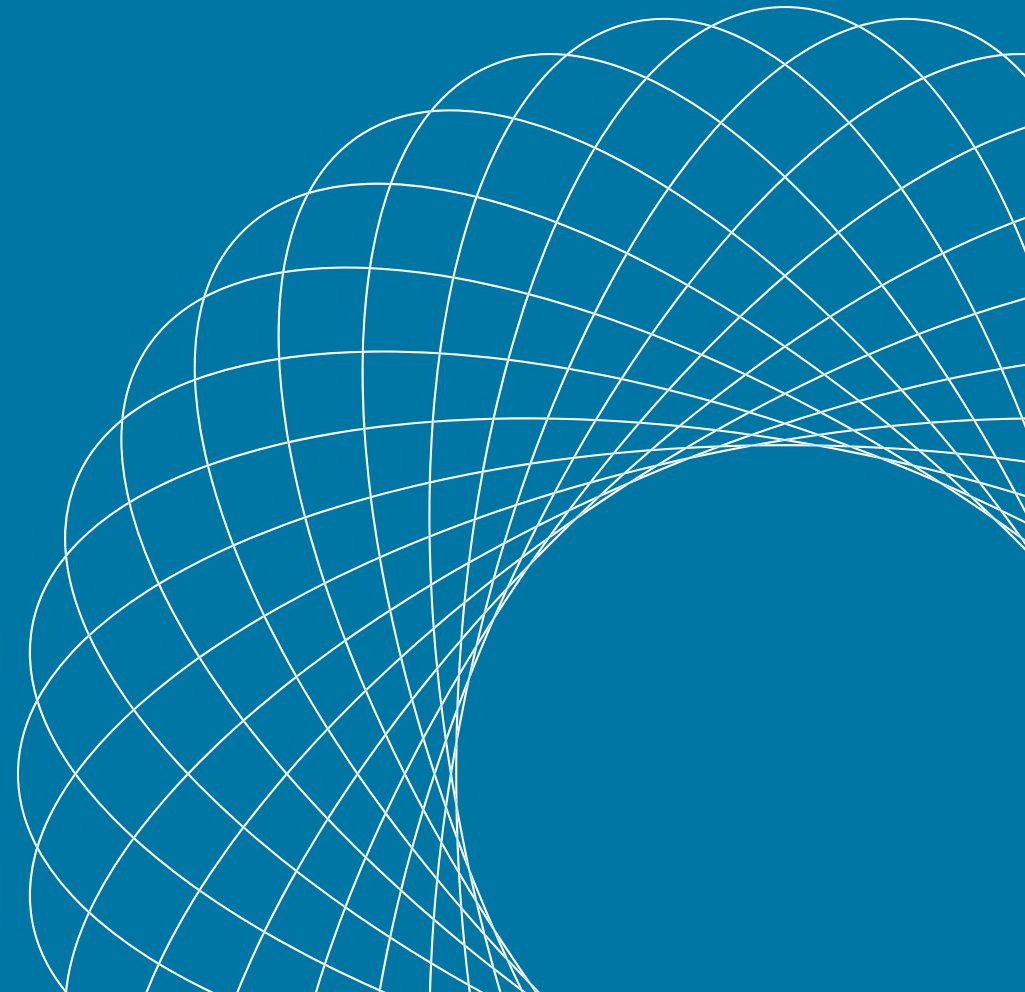
# Data Center Involvement

Respondent samples are consistent over time, with most reporting their organizations have their own data centers.



■ 2020    ■ 2017

| | 62% | 61% |
| Organization with own data centers | | |
| Colocation service/ managed services provider | 30% | 31% |
| Supercomputing or research facility | 8% | 8% |
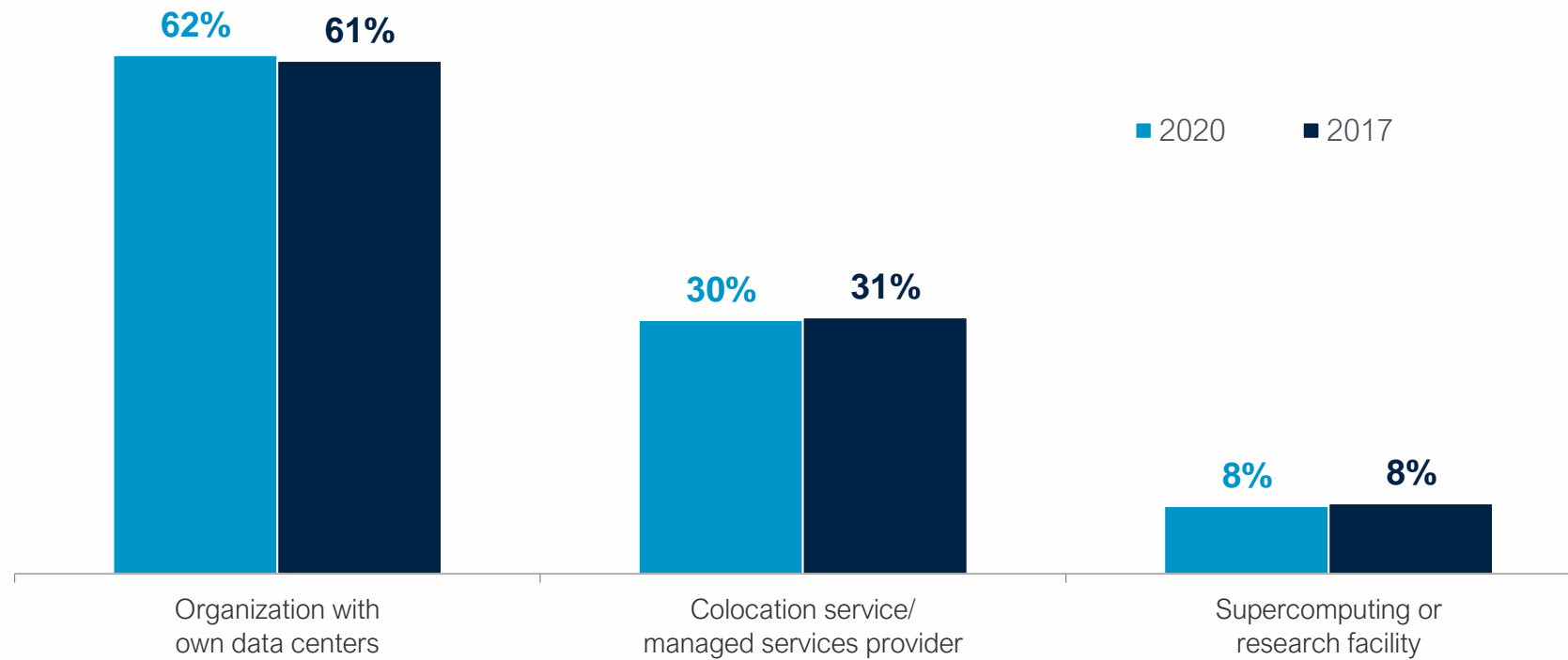
*Question: Which of the following best reflects your business, with regard to data center involvement?*

*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Professional Profile: Job Title & Functional Area Involvement

Professional profiles and functional area involvement are larger consistent over time, with one key difference: the 2020 sample included more Directors or Middle Managers, and the 2017 sample included more non-management roles.

## Current Job Title

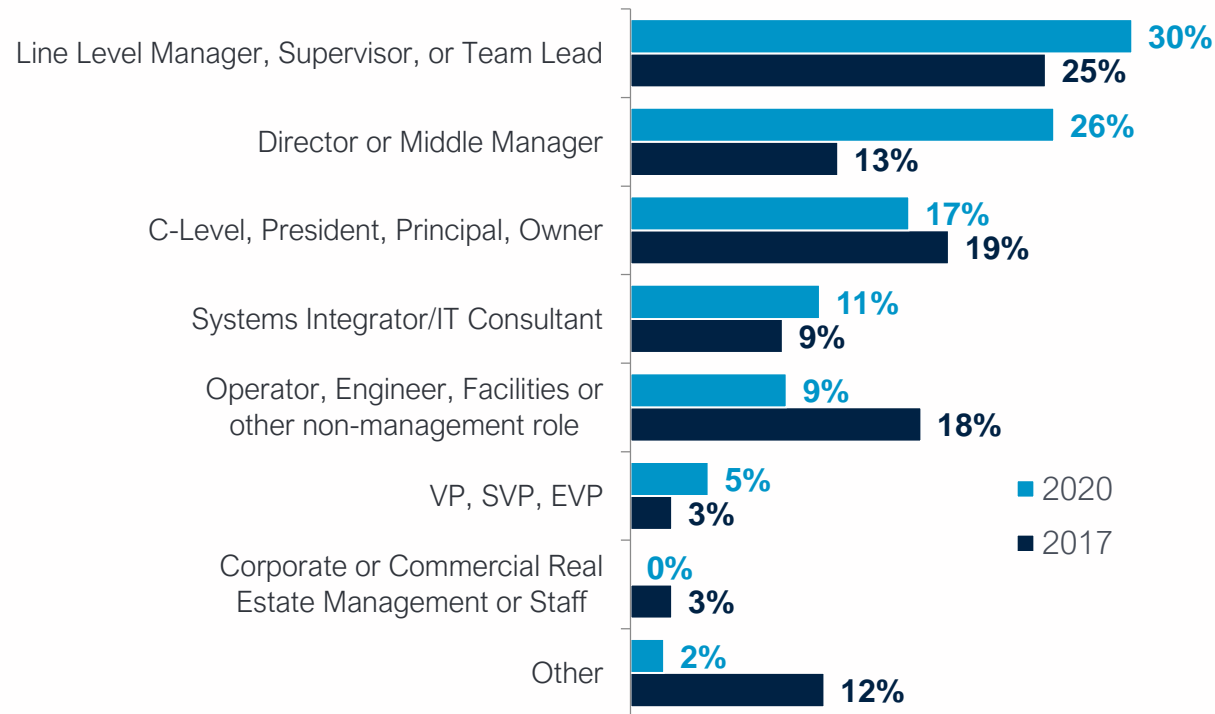| Job Title | 2020 | 2017 |
|---|---|---|
| Line Level Manager, Supervisor, or Team Lead | 30% | 25% |
| Director or Middle Manager | 26% | 13% |
| C-Level, President, Principal, Owner | 17% | 19% |
| Systems Integrator/IT Consultant | 11% | 9% |
| Operator, Engineer, Facilities or other non-management role | 9% | 18% |
| VP, SVP, EVP | 5% | 3% |
| Corporate or Commercial Real Estate Management or Staff | 0% | 3% |
| Other | 2% | 12% |

## Functional Area Involvement

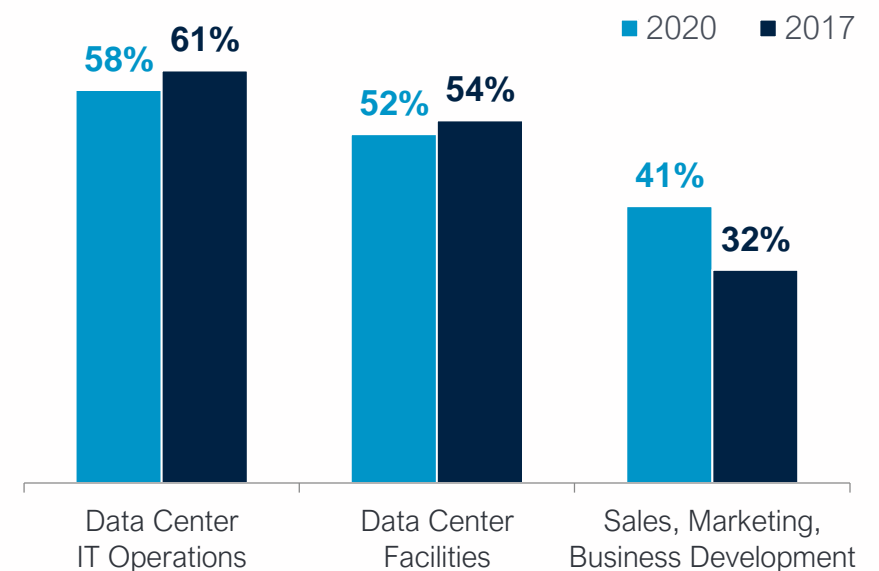| | 2020 | 2017 |
|---|---|---|
| Data Center IT Operations | 58% | 61% |
| Data Center Facilities | 52% | 54% |
| Sales, Marketing, Business Development | 41% | 32% |

*Question: Which of the following best described your current title?*
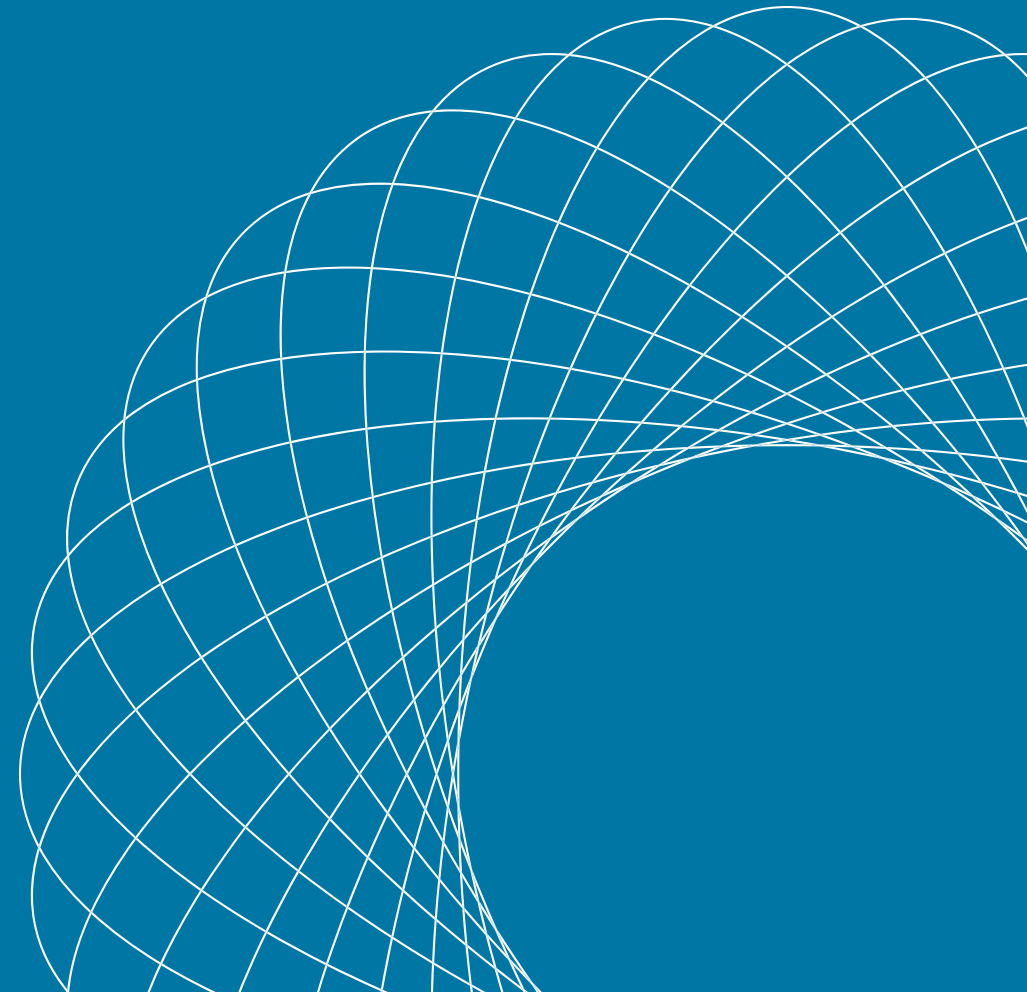*Base: All respondents; 2020 (n=149); 2017 (n=131).*

*Question: Regardless of title, in which of the following corporate areas/functions are you involved? (Select all that apply.)*
*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Key Findings

# Impact of Data Center Cooling Costs on Overall Operating Costs

Over time, the cost of cooling data centers appears to have less impact on overall operating costs (2020, 41% indicating "significant" or "most" impact; 2017, 53% indicating "significant" or "most" impact).

Legend: ■ 2020  ■ 2017

| | Single most impactful factor | Significant impact | Moderate impact | Slight impact | No meaningful impact |
|---|---|---|---|---|---|
| 2020 | 2% | 39% | 33% | 15% | 11% |
| 2017 | 8% | 45% | 29% | 12% | 6% |
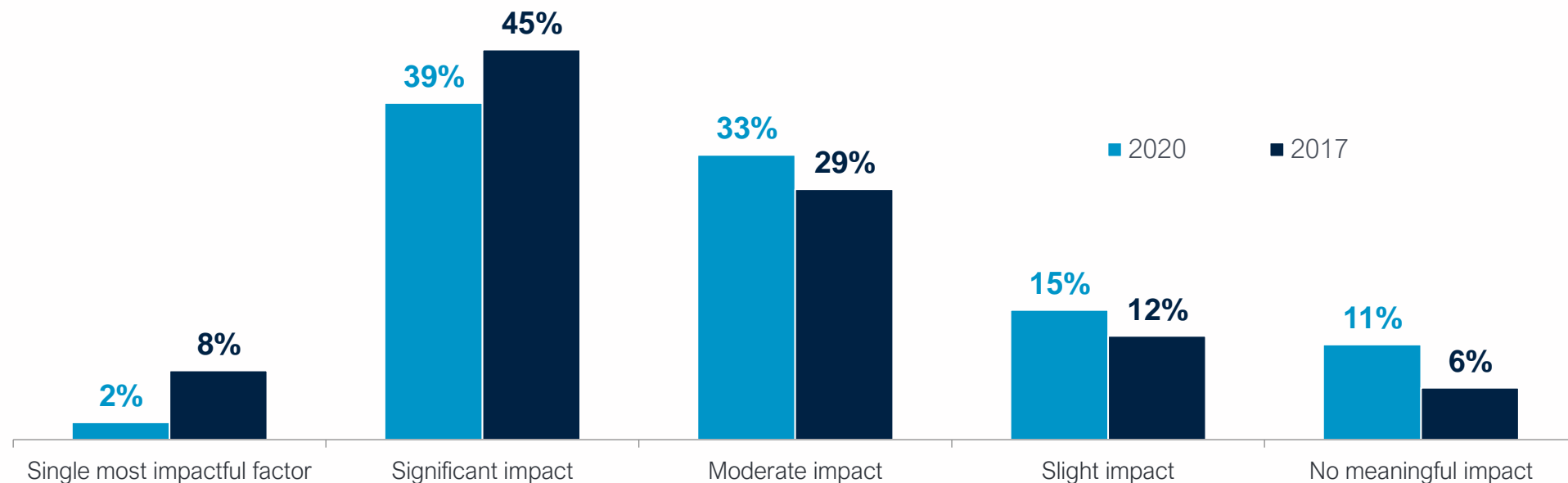
*Question: How much does the cost of cooling your data center(s) impact your overall operating costs?*

*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Reducing Demands on Data Center Cooling Systems

While the top four methods used to reduce demand on data center cooling systems remained the same, the degree of reliance two methods has chan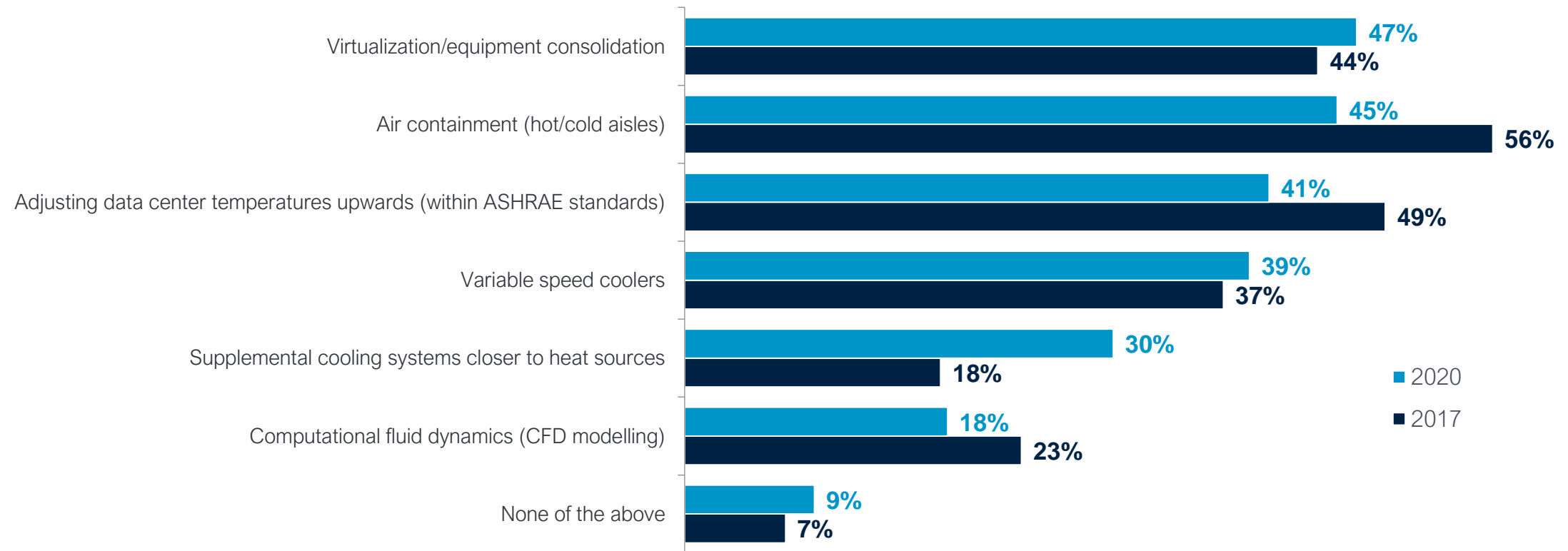ged over time. In 2017, respondents were more likely to rely on air containment (56% vs. 45% in 2020) and adjusting data center temps upward (49% vs. 41% in 2020). In 2020, respondents were more likely to leverage supplemental cooling systems closer to heat sources (30% vs. 18% in 2017).

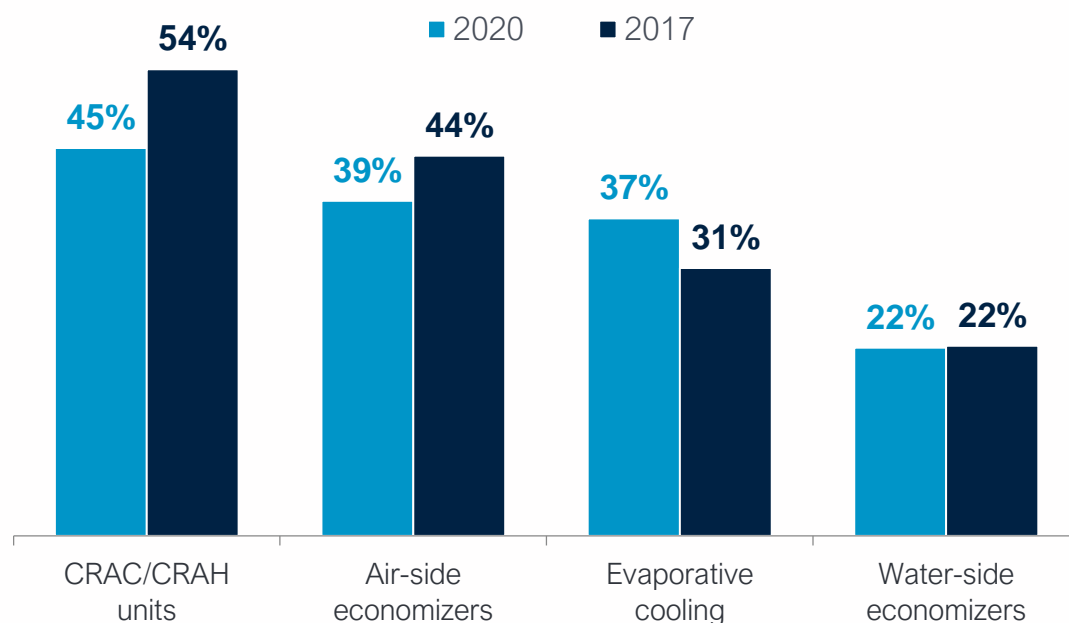| Method | 2020 | 2017 |
|---|---|---|
| Virtualization/equipment consolidation | 47% | 44% |
| Air containment (hot/cold aisles) | 45% | 56% |
| Adjusting data center temperatures upwards (within ASHRAE standards) | 41% | 49% |
| Variable speed coolers | 39% | 37% |
| Supplemental cooling systems closer to heat sources | 30% | 18% |
| Computational fluid dynamics (CFD modelling) | 18% | 23% |
| None of the above | 9% | 7% |

*Question: How have you reduced the demands on your cooling systems in the data center? (Select all that apply.)*

*Base: All respondents; 2020 (n=149); 2017 (n=131); multiple answers permitted.*

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# Data Center Cooling: Methods, Monitoring & Control

Respondents in both studies were most likely to use CRAC/CRAH units for data center cooling, followed by air-side economizers and evaporative cooling. Use of CRAC/CRAH units has diminished over time. In 2020, respondents are marginally more likely to monitor and control data center cooling systems manually than they were in 2017.



**Data Center Cooling Method(s) Used**

- 2020
- 2017

| | 2020 | 2017 |
|---|---|---|
| CRAC/CRAH units | 45% | 54% |
| Air-side economizers | 39% | 44% |
| Evaporative cooling | 37% | 31% |
| Water-side economizers | 22% | 22% |

**Means of Monitoring & Controlling Data Center Cooling Systems**

| | 2020 | 2017 |
|---|---|---|
| Data center information management system (DCIM) | 53% | 53% |
| Dedicated cooling management system (bespoke or third party) | 38% | 42% |
| Manually | 30% | 22% |

- 2020
- 2017

*Question: What data center cooling method(s) does your company use? (Select all that apply.)*
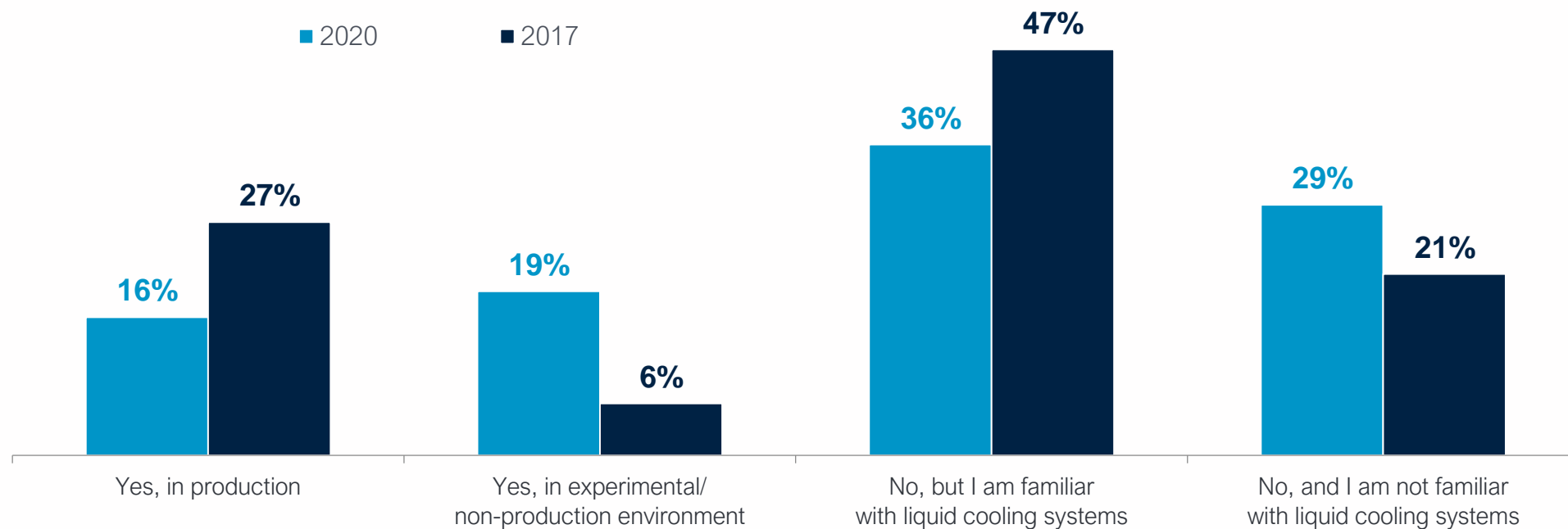*Base: All respondents; 2020 (n=149); 2017 (n=131); multiple answers permitted.*
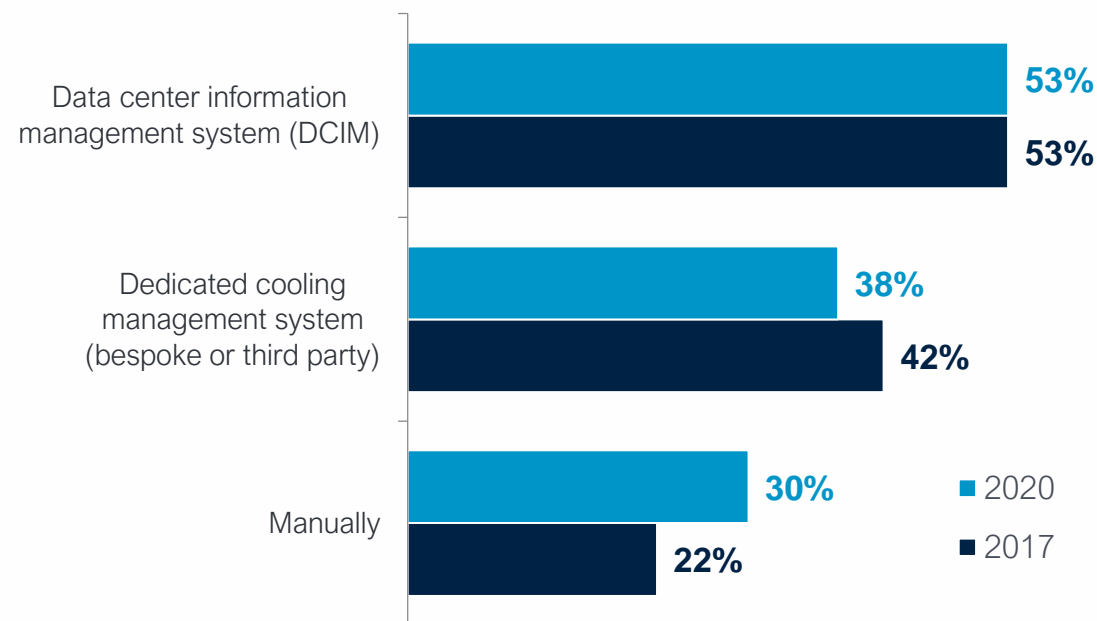
*Question: How do you monitor and control your data center cooling system? (Select all that apply.)*
*Base: All respondents; 2020 (n=149); 2017 (n=131); multiple answers permitted.*

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# Use of Liquid Cooling Systems

A third of respondents in both studies reported using liquid cooling systems (35% in 2020; 33% in 2017). More respondents reported using liquid cooling systems in production in 2017 (27%) than in 2020 (16%).



Legend: ■ 2020  ■ 2017

| | Yes, in production | Yes, in experimental/ non-production environment | No, but I am familiar with liquid cooling systems | No, and I am not familiar with liquid cooling systems |
|---|---|---|---|---|
| 2020 | 16% | 19% | 36% | 29% |
| 2017 | 27% | 6% | 47% | 21% |

*Question: Do you use a liquid cooling system?*

*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Liquid Cooling Techniques Used

Respondents in 2020 were more likely than 2017 respondents to report relying on water cooled read door systems and/or in-row cooling. Usage of all forms of liquid cooling techniques has increased over time, with the sole exception of direct-contact liquid cooling.
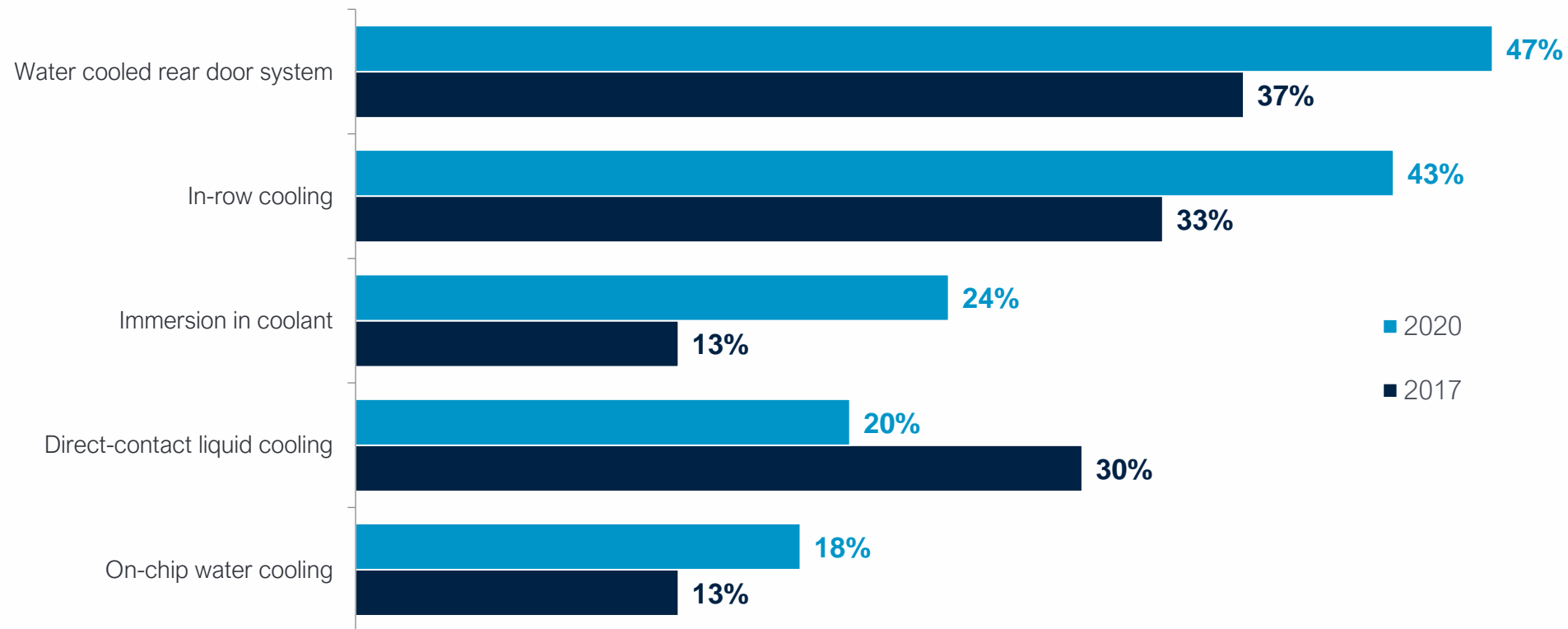


Water cooled rear door system: 2020 47%, 2017 37%
In-row cooling: 2020 43%, 2017 33%
Immersion in coolant: 2020 24%, 2017 13%
Direct-contact liquid cooling: 2020 20%, 2017 30%
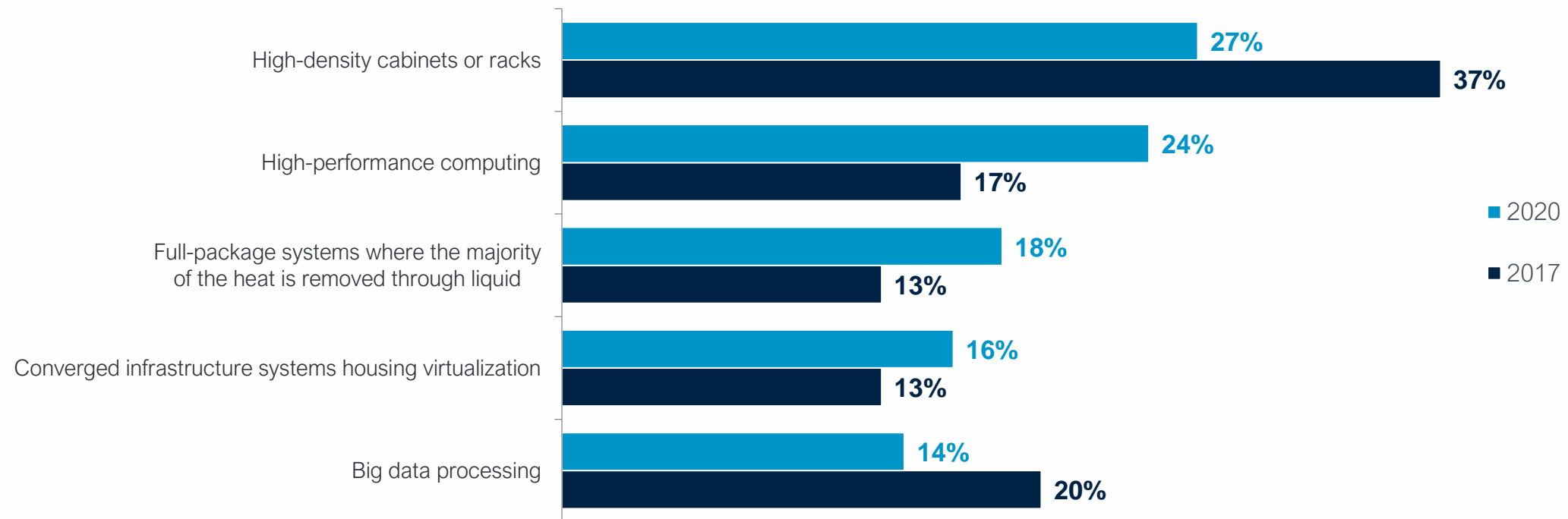On-chip water cooling: 2020 18%, 2017 13%

Legend: ■ 2020 ■ 2017

*Question: What data center cooling method(s) does your company use? (Select all that apply.)*

*Base: Respondents currently using liquid cooling techniques; 2020 (n=51); 2017 (n=30); multiple answers permitted.*

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# Primary Impact Area of Liquid Cooling

Respondents in 2017 were most likely to believe liquid cooling had the most impact on high-density cabinets or racks. In 2020, respondents were more divided on the highest impact area, with 27% indicating high-density cabinets or racks and 24% indicating high-performance computing.



Legend:
- 2020
- 2017

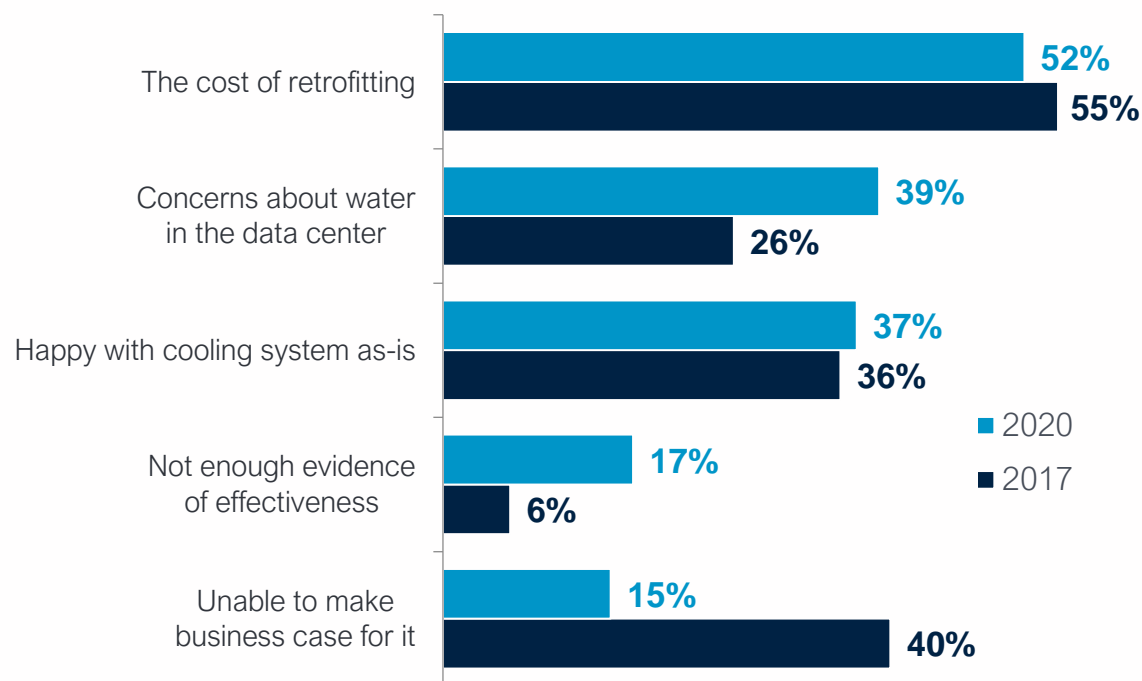| Impact Area | 2020 | 2017 |
|---|---|---|
| High-density cabinets or racks | 27% | 37% |
| High-performance computing | 24% | 17% |
| Full-package systems where the majority of the heat is removed through liquid | 18% | 13% |
| Converged infrastructure systems housing virtualization | 16% | 13% |
| Big data processing | 14% | 20% |

*Question: Where do you believe liquid cooling has the most impact in your data center?*

*Base: Respondents currently using liquid cooling techniques; 2020 (n=51); 2017 (n=30); multiple answers permitted.*

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# Deterrents to Use of Liquid Cooling, Most Likely Implementations

When asked what has deterred their companies from implementing liquid cooling solutions, respondents in 2020 were more likely to cite concerns about water in the data center than were those in 2017. Over time, concerns about making a business case for liquid cooling have diminished significantly. 2020 respondents not currently using liquid cooling reported their companies would be most likely to implement in-row cooling (50%).
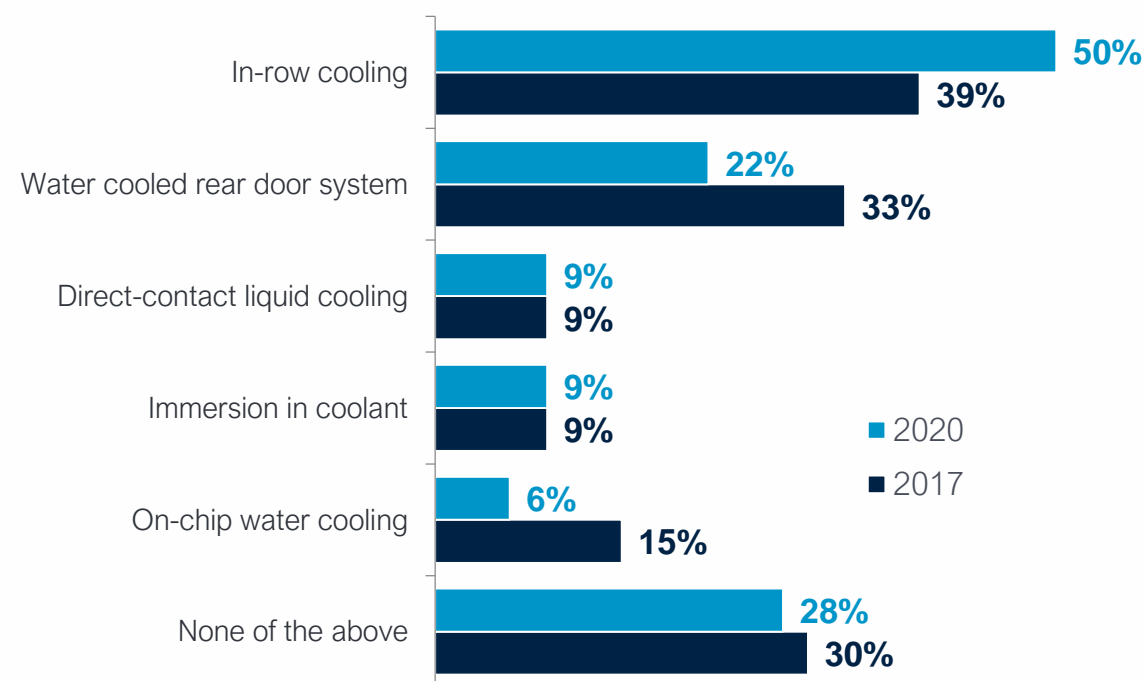
## Deterrents to Implementing a Liquid Cooling Solution

| Deterrent | 2020 | 2017 |
|---|---|---|
| The cost of retrofitting | 52% | 55% |
| Concerns about water in the data center | 39% | 26% |
| Happy with cooling system as-is | 37% | 36% |
| Not enough evidence of effectiveness | 17% | 6% |
| Unable to make business case for it | 15% | 40% |

## Liquid Cooling Techniques Company Would Be Most Likely to Implement

| Technique | 2020 | 2017 |
|---|---|---|
| In-row cooling | 50% | 39% |
| Water cooled rear door system | 22% | 33% |
| Direct-contact liquid cooling | 9% | 9% |
| Immersion in coolant | 9% | 9% |
| On-chip water cooling | 6% | 15% |
| None of the above | 28% | 30% |

**Question: Which of the following considerations have deterred your company from implementing a liquid cooling solution? (Select all that apply.)**

Base: Respondents not currently using liquid cooling; 2020 (n=54); 2017 (n=47).

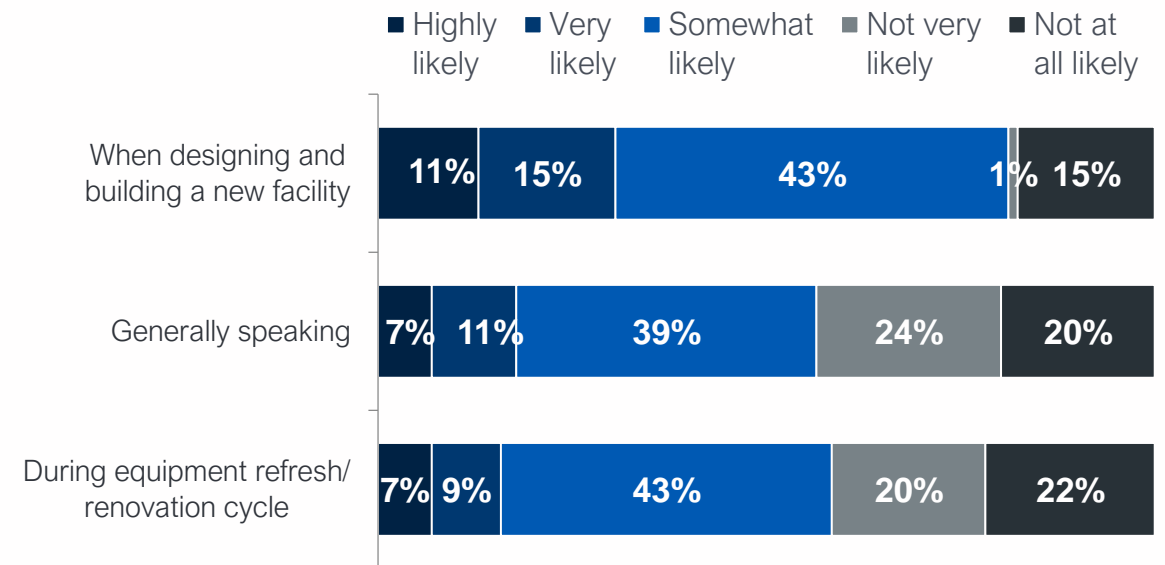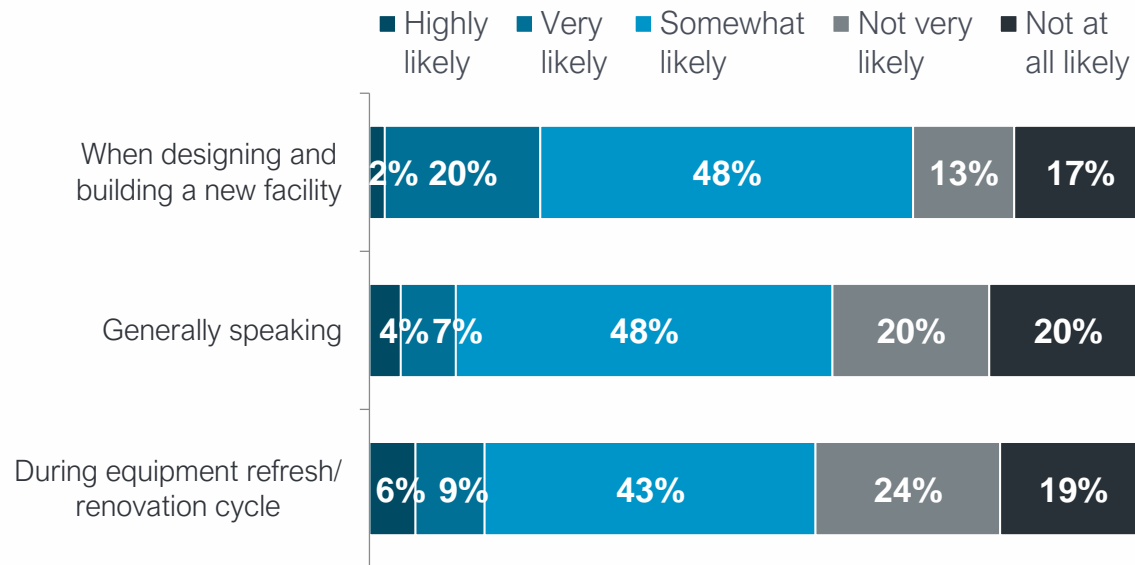**Question: Which liquid cooling technique(s) would your company be most likely to implement? (Select all that apply.)**

Base: Respondents not currently using liquid cooling; 2020 (n=54); 2017 (n=47).

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# Likelihood of Considering Liquid Cooling in the Future

Most of those not currently leveraging liquid cooling were likely to consider doing so in the future. Over time, respondents remained most likely to consider liquid cooling when designing and building a new facility (70% at least "somewhat likely" in 2020; 69% at least "somewhat likely" in 2017).



**2020**

Legend: ■ Highly likely ■ Very likely ■ Somewhat likely ■ Not very likely ■ Not at all likely

| | Highly likely | Very likely | Somewhat likely | Not very likely | Not at all likely |
|---|---|---|---|---|---|
| When designing and building a new facility | 2% | 20% | 48% | 13% | 17% |
| Generally speaking | 4% | 7% | 48% | 20% | 20% |
| During equipment refresh/renovation cycle | 6% | 9% | 43% | 24% | 19% |

**2017**

Legend: ■ Highly likely ■ Very likely ■ Somewhat likely ■ Not very likely ■ Not at all likely

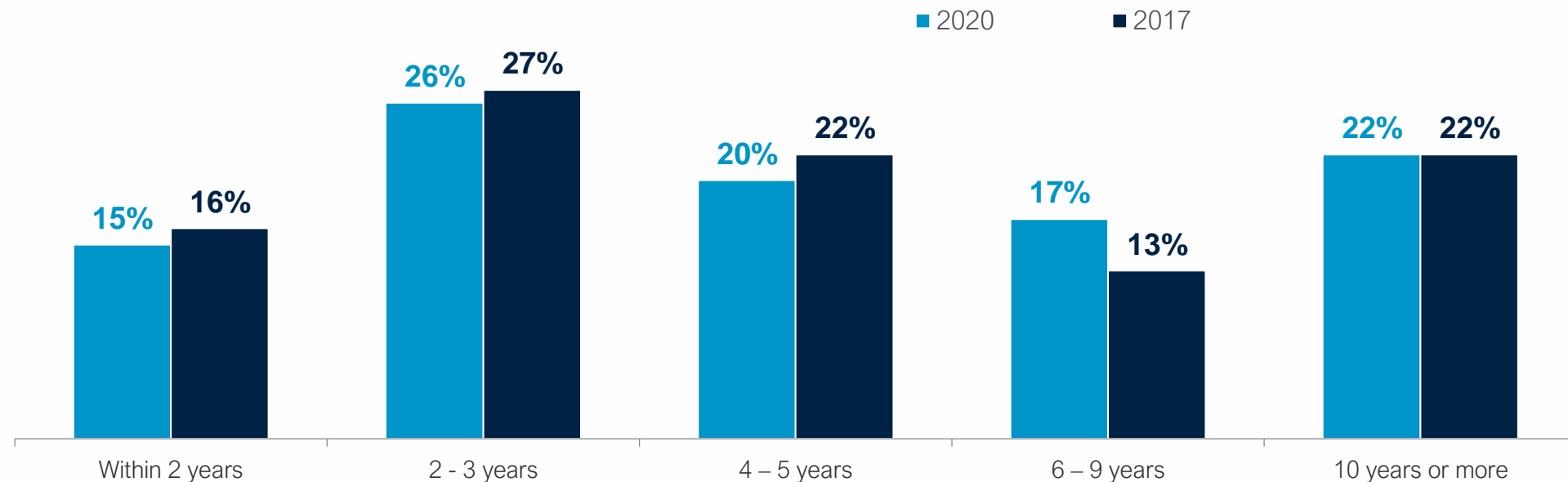| | Highly likely | Very likely | Somewhat likely | Not very likely | Not at all likely |
|---|---|---|---|---|---|
| When designing and building a new facility | 11% | 15% | 43% | 1% | 15% |
| Generally speaking | 7% | 11% | 39% | 24% | 20% |
| During equipment refresh/renovation cycle | 7% | 9% | 43% | 20% | 22% |

*Question: How likely is your company to consider liquid cooling in the future?*

*Base: Respondents not currently using liquid cooling; 2020 (n=54); 2017 (n=47).*

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# Timeline for Moving to Liquid Cooling

The timeline for those not currently using liquid cooling to report their companies would be prepared to actively consider doing so has not changed meaningfully over time, with 41% of those in 2020, and 43% of those in 2017 believing their companies would do so within three years.
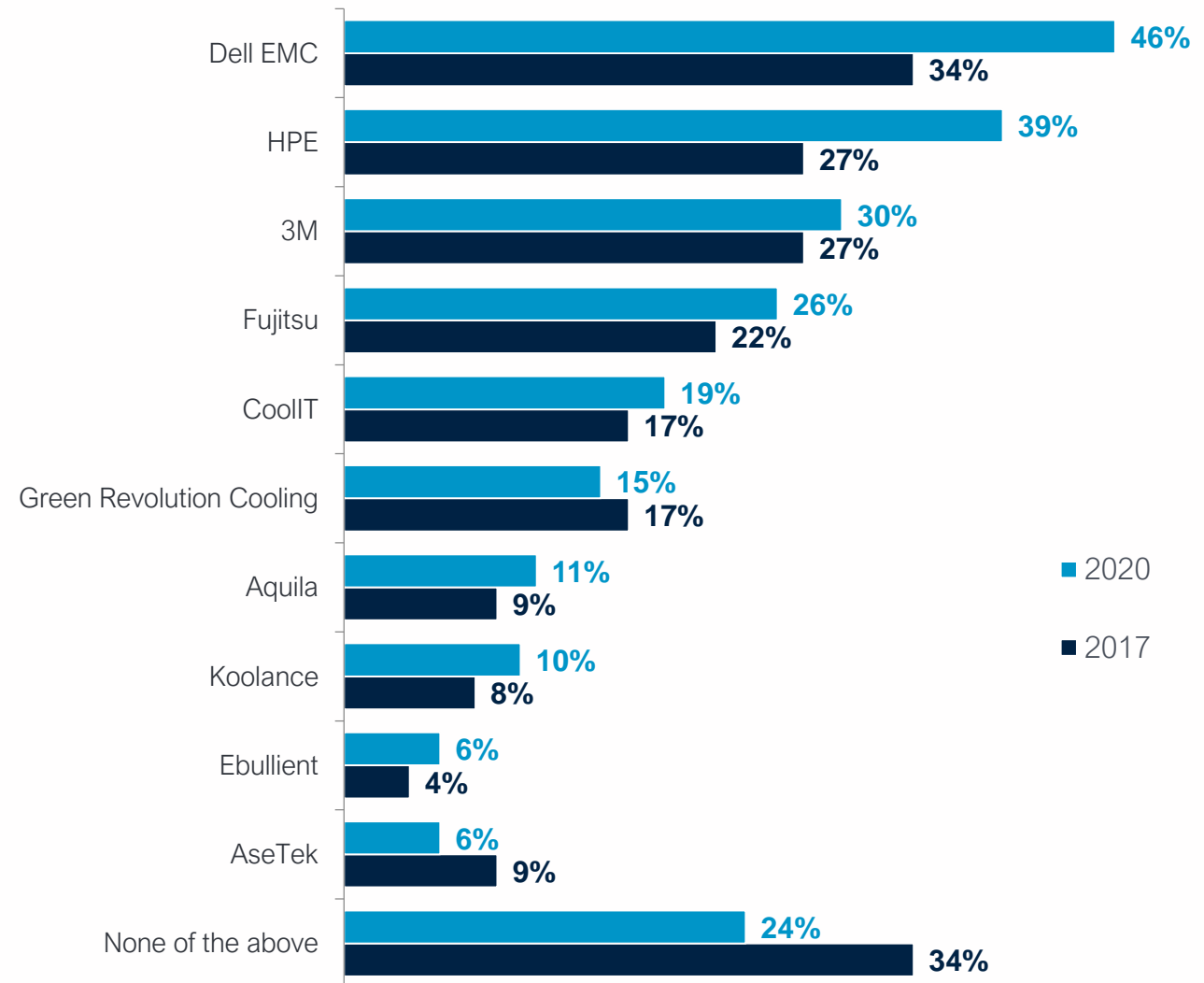
■ 2020    ■ 2017

| | Within 2 years | 2 - 3 years | 4 – 5 years | 6 – 9 years | 10 years or more |
|---|---|---|---|---|---|
| 2020 | 15% | 26% | 20% | 17% | 22% |
| 2017 | 16% | 27% | 22% | 13% | 22% |

*Question: When do you think your company will be prepared to actively consider a move to liquid cooling?*

*Base: Respondents not currently using liquid cooling; 2020 (n=54); 2017 (n=47).*

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# Familiarity with Liquid Cooling Brands

Familiarity with both Dell EMC and HPE has increased significantly over time. Dell EMC retained its front-runner status in 2020.
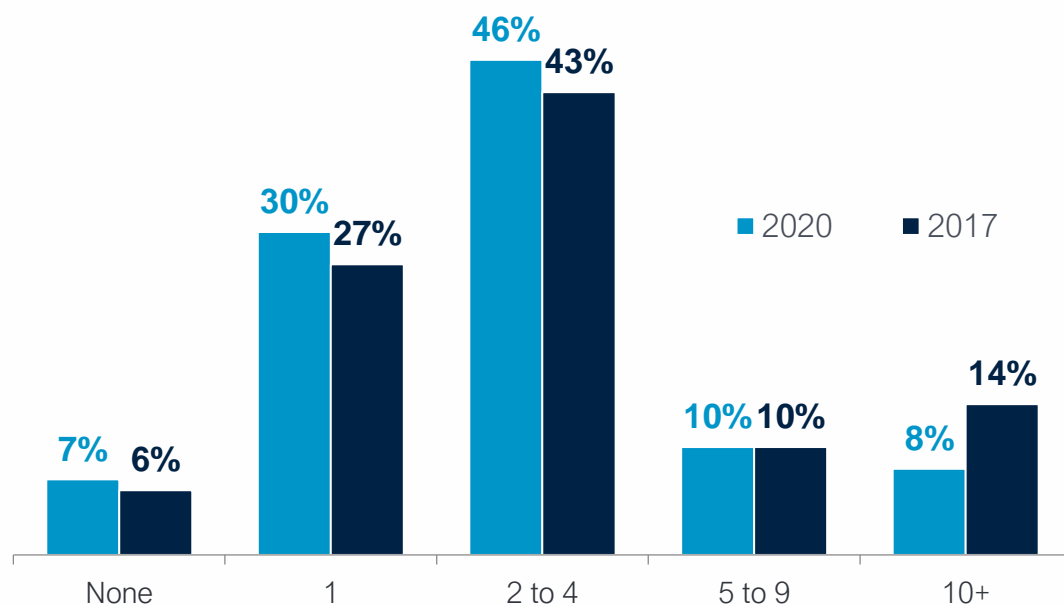


| Brand | 2020 | 2017 |
|-------|------|------|
| Dell EMC | 46% | 34% |
| HPE | 39% | 27% |
| 3M | 30% | 27% |
| Fujitsu | 26% | 22% |
| CoolIT | 19% | 17% |
| Green Revolution Cooling | 15% | 17% |
| Aquila | 11% | 9% |
| Koolance | 10% | 8% |
| Ebullient | 6% | 4% |
| AseTek | 6% | 9% |
| None of the above | 24% | 34% |

■ 2020
■ 2017

*Question: Which liquid cooling brands are you familiar with? (Select all that apply.)*

*Base: All respondents; 2020 (n=149); 2017 (n=131); multiple answers permitted.*

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# Number of Data Centers, Square Footage of Typical Data Center

The typical respondent reports owning and operating an estimated mean five data centers in both the 2020 and 2017 studies. The footprint of the average data center size has increased slightly over time, with an average 25,123 square feet in 2020, compared to an average 23,080 square feet in 2017.
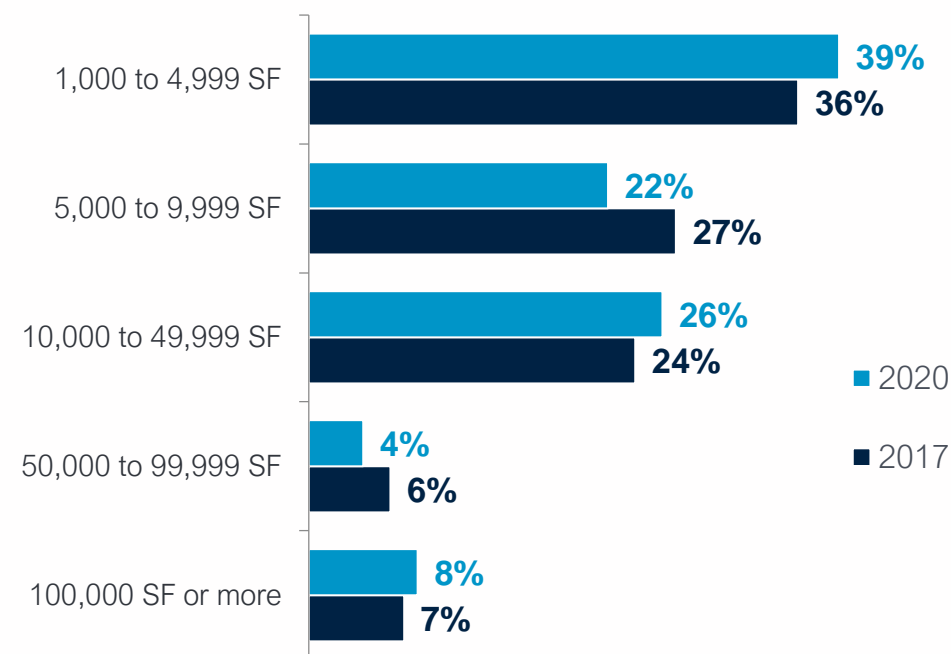
## Number of Data Centers Owned/Operated



| | 2020 | 2017 |
|---|---|---|
| None | 7% | 6% |
| 1 | 30% | 27% |
| 2 to 4 | 46% | 43% |
| 5 to 9 | 10% | 10% |
| 10+ | 8% | 14% |

## Square Footage of Typical Data Center



| | 2020 | 2017 |
|---|---|---|
| 1,000 to 4,999 SF | 39% | 36% |
| 5,000 to 9,999 SF | 22% | 27% |
| 10,000 to 49,999 SF | 26% | 24% |
| 50,000 to 99,999 SF | 4% | 6% |
| 100,000 SF or more | 8% | 7% |

*Question: How many data centers you own/operate?*
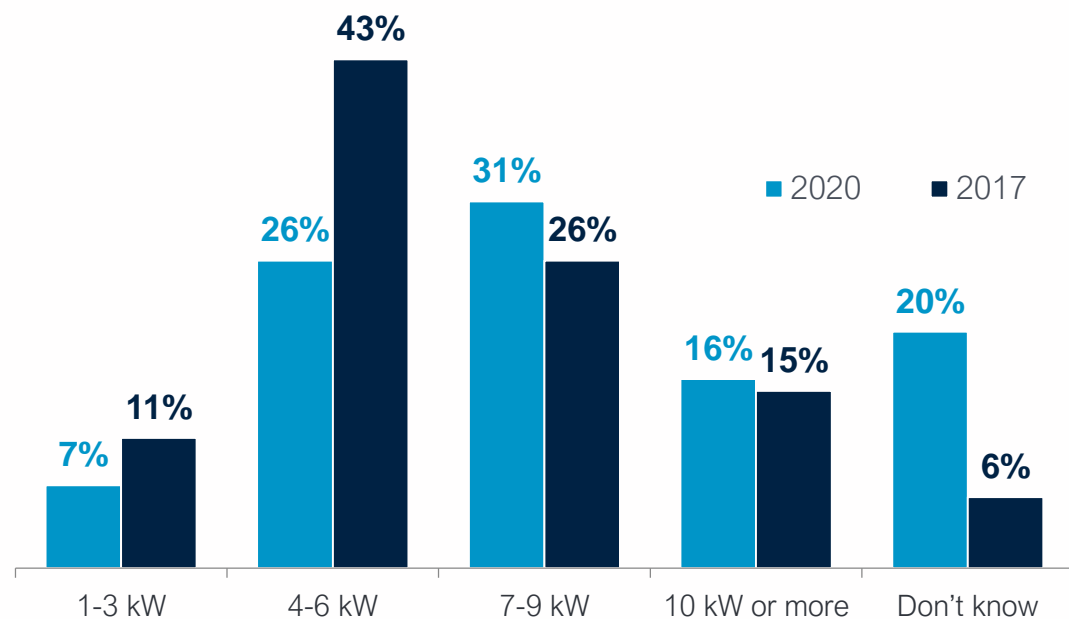*Base: All respondents; 2020 (n=149); 2017 (n=131).*

*Question: How big is your data center (if one)? How big is your average data center (if multiple)?*
*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Rack Power Density

Target rack power density has increased over time, with an average 7.3 kW in 2020, compare to an average 6.5 kW in 2017. As in 2017, a majority of respondents in 2020 report their rack power density is increasing (60%).

## Target Rack Power Density (kW per Cabinet)



Legend: 2020, 2017

| | 1-3 kW | 4-6 kW | 7-9 kW | 10 kW or more | Don't know |
|---|---|---|---|---|---|
| 2020 | 7% | 26% | 31% | 16% | 20% |
| 2017 | 11% | 43% | 26% | 15% | 6% |

## Is your rack power density increasing?



Legend: 2020, 2017

| | Definitely | Probably | Possibly | Probably not | No |
|---|---|---|---|---|---|
| 2020 | 25% | 35% | 28% | 7% | 6% |
| 2017 | 37% | 26% | 24% | 11% | 2% |

*Question: What is your target rack power density (i.e., how many KW per cabinet)?*
*Base: All respondents; 2020 (n=149); 2017 (n=131).*
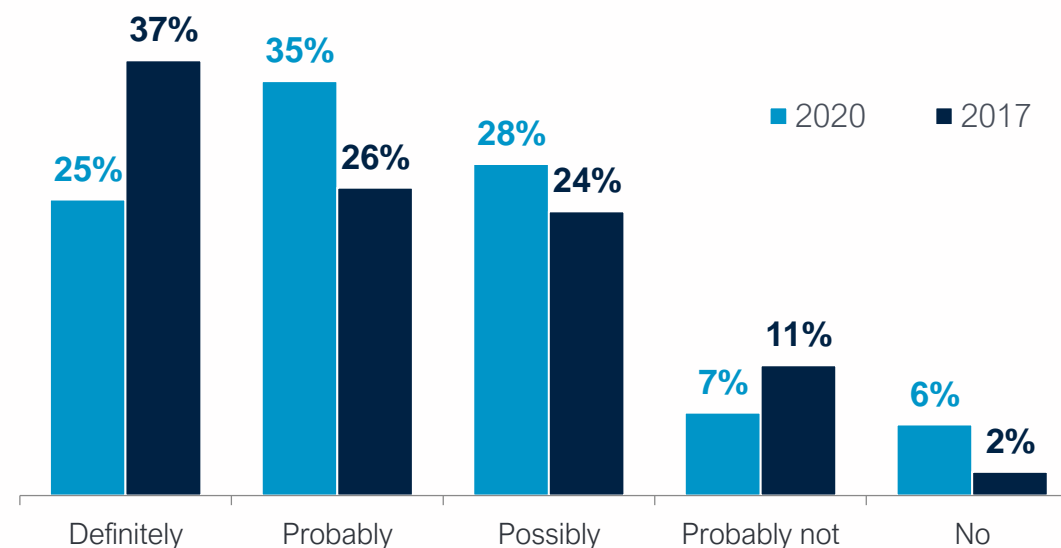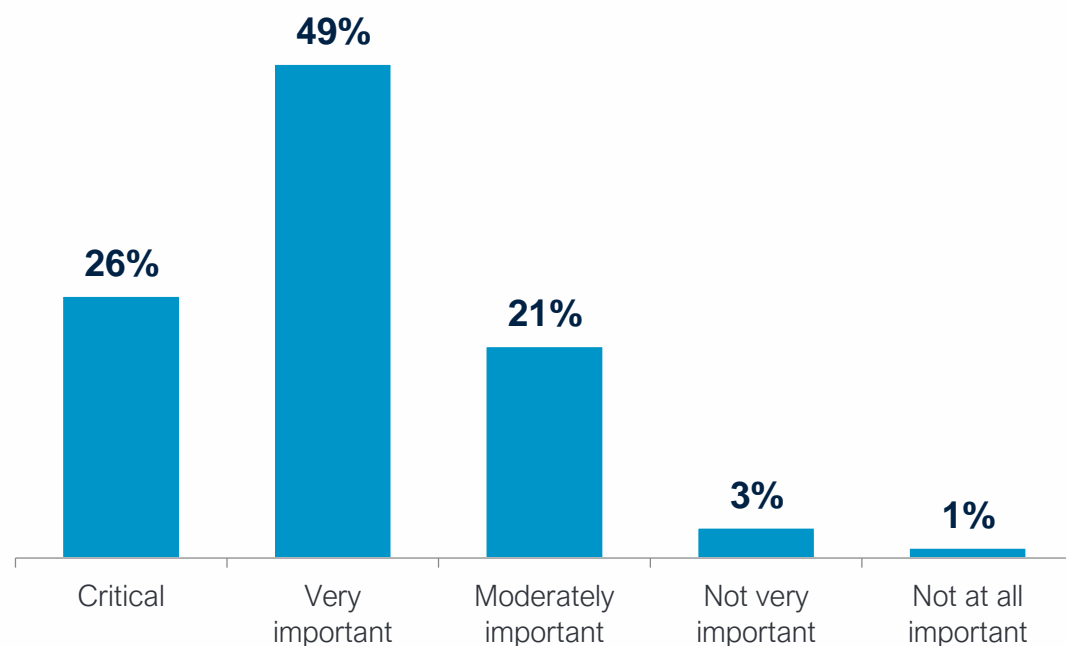
*Question: Do you believe your rack power density is increasing?*
*Base: All respondents; 2020 (n=149); 2017 (n=131).*

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# Importance & Impact of Sustainability (2020)

Three in four respondents (75%) report sustainability is at least "very important" to their organizations, including 26% who consider it "critical". A majority (61%) also report a vendor's focus on sustainability considerations actually increases the likelihood of purchasing from that vendor.

## Importance of Sustainability

| Critical | Very important | Moderately important | Not very important | Not at all important |
|----------|---------------|---------------------|-------------------|---------------------|
| 26% | 49% | 21% | 3% | 1% |

## Does a vendor's sustainability focus increase likelihood of purchasing from that vendor?

| Definitely | Probably | Possibly | Probably not | No |
|-----------|----------|----------|-------------|-----|
| 24% | 37% | 30% | 7% | 2% |

*Question: How important is sustainability to your organization?*

*Base: All respondents; 2020 (n=149). Question was not asked in 2017.*
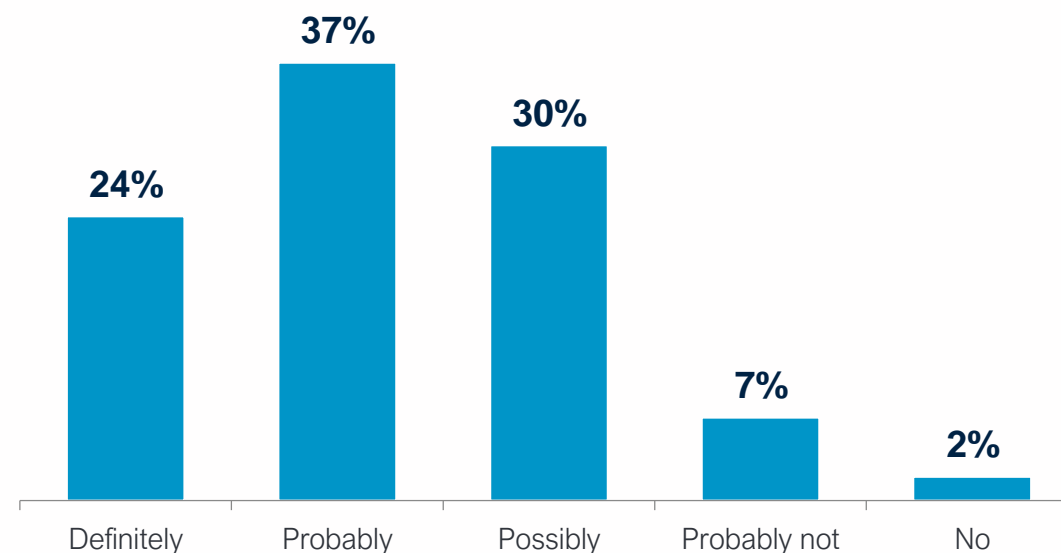
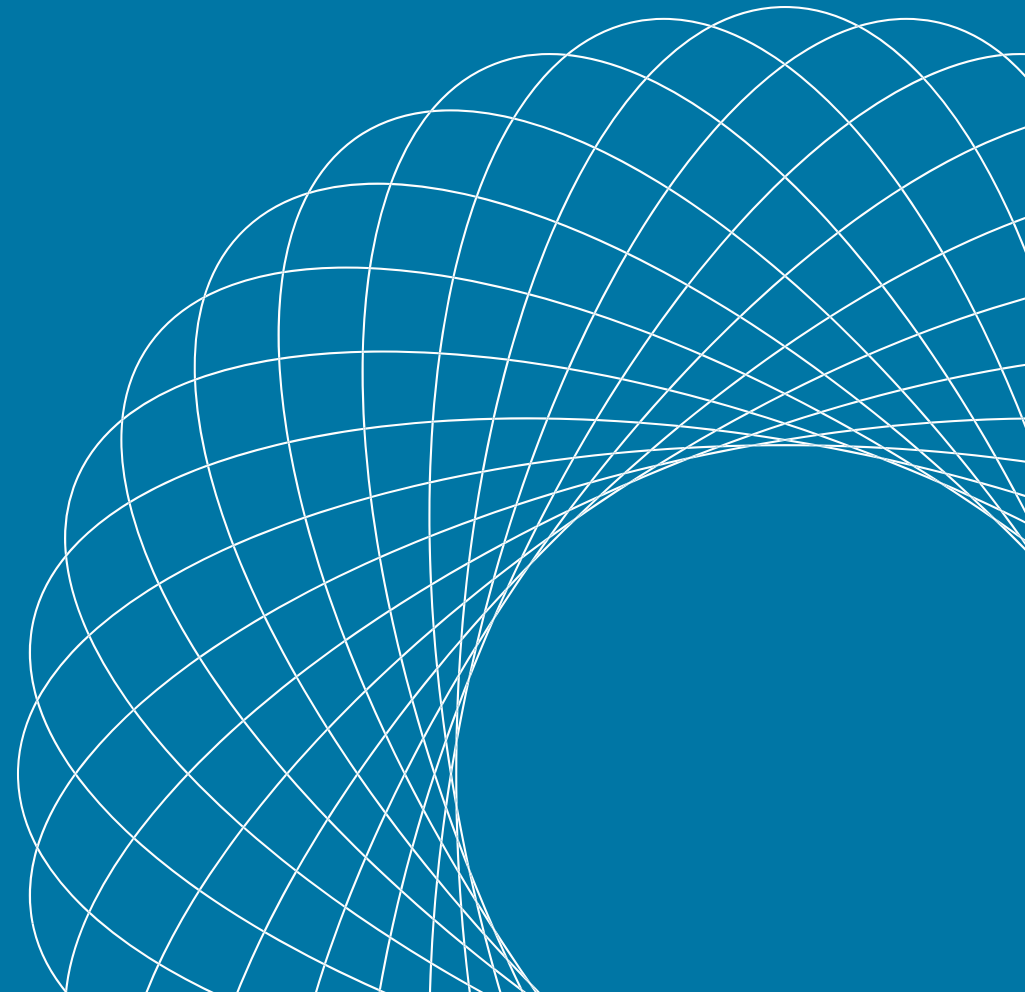*Question: Does a vendor's focus on sustainability considerations (e.g., use of recycled or renewable materials) increase your likelihood of purchasing from that vendor?*

*Base: All respondents; 2020 (n=149). Question was not asked in 2017.*

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# About Informa Engage

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Informa Engage is the marketing services powerhouse behind Informa's trusted brands. We provide B2B marketers with unrivaled specialist audiences, deep knowledge of vertical markets, sophisticated data and content marketing expertise. Through our deep understanding of our customer's behaviors and changing needs, Informa Engage connects marketers to customers as they move from discovering a problem to identifying features and functionality of a solution to selecting a provider and making a purchase.

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The Informa Engage Market Research team adheres to the highest standards in market research, conducting over 300 custom research studies each year for B2B clients in a wide variety of industries. Each member of the Research Leadership Team has over 20 years of research experience.



**Kristin Letourneau, PhD**
Director of Market Research
kristin.letourneau@informa.com
Overland Park, KS



**Scott Grau, MS**
Senior Market Research Manager
scott.grau@informa.com
Minneapolis, MN



**Steffan Herbage, MPhil**
Market Research Manager
steffan.herbage@informa.com
London, UK

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# Thank you!

Kristin Letourneau, PhD
Director, Market Research
Informa Engage
Overland Park, KS, USA

T (913) 967-1892
E kristin.letourneau@informa.com
W engage.informa.com